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EXAMINER

VITAL, PIERRE M

ART UNIT	PAPER NUMBER
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2188

DATE MAILED: 08/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/047,754

Applicant(s)

SRINIVASAN, VARADARAJAN

Examiner

Pierre M. Vital

Art Unit

2188

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 June 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 37-58 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 37-51 and 53-58 is/are rejected.
- 7) ☒ Claim(s) 52 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

N

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 7, 2005 has been entered.

### ***Response to Amendment***

2. This Office Action is in response to applicant's communication filed June 7, 2005 in response to PTO Office Action mailed January 3, 2005. The Applicant's remarks and amendments to the claims and/or the specification were considered with the results that follow.

3. In response to the last Office Action, no claims have been amended. Claims 1-36 have been canceled. Claims 37-58 have been added. As a result, claims 37-58 are now pending in this application.

### ***Response to Arguments***

4. Applicant's arguments with respect to claims 37-58 have been considered but are moot in view of the new ground(s) of rejection.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 37, 42-44, 46-48 and 53-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow (US Pub 2002/0126672) in view of Baum (US 5,619,713).

As per claim 37, Chow discloses a content addressable memory (CAM) apparatus comprising:

an array of CAM cells to store data to be compared with a comparand value (Fig. 1, element 106; Fig. 2, element 216; page 1, ¶ 9) ;

a select circuit to store a plurality of segment-select values, each segment-select value indicating which of a plurality of segments of input data is to source a respective bit of the comparand value (Fig. 2, elements 204 and 206; page 3, ¶ 37; page 4, ¶ 40);  
and

switch circuitry to output, as the comparand value, one or more bits of each of the plurality of segments of input data indicated by the select circuit to be a source of a bit of the comparand value (Fig. 2, element 204; page 4, ¶ 40-41).

Chow does not specifically teach that the select circuit stores a plurality of segment-select values, nor does Chow teach that the switch circuitry to output a bit in response to one of the select signals as required by claim 37.

Baum teaches a crosspoint switch (i.e. crossbar) for reordering the fields of a database record that is controlled by a plurality of select signals generated by a select circuit (Fig. 17B, elements 1704, 1724 and 1725; column 30, lines 59-62; column 32, lines 16-18 and 42-48), where it readily apparent that the crosspoint switch outputs bytes in response to the select signals, and it is further noted that a byte comprises bits. Baum teaches that the field reordering is-useful for picking subsets of fields for easier pattern matching (column 30, lines 30-44).

Regarding claim 37, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use the switch circuitry of Baum in the system of Chow, in order to pick subsets of fields for easier pattern matching.

Claim 42 is rejected using the rationale derived from Chow and Baum in the rejection of claim 37 above. However, Chow does not explicitly teach a program circuit coupled to the switch circuits for programming the switch circuits as required by claim 42.

Baum teaches a program circuit coupled to the switch circuits for programming the switch circuits in order to control the reordering of data through the switch (Fig. 17B, element 1724; column 32, lines 16-18 and 42-48).

Regarding claim 42, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to include a program circuit coupled to the switch circuits for programming the switch circuits as taught by Baum, in the system made obvious by the combination of Chow and Baum as applied to claim 1 above, in order to control the reordering of data through the switch as taught by Baum.

Claim 43 is rejected according to the same rationale as for the rejection of claim 37 above.

Claim 44 is rejected using the rationale derived from Chow and Baum in the rejection of claim 37 above. However, Chow does not explicitly teach a comparand register between the switch circuit and the array of CAM cells for storing a comparand value as required by claim 44.

Baum teaches a storage buffer for staging the data being reordered through the switch (Fig. 17B, element 1728; column 32, lines 52-65; column 34, lines 30-34), where it is noted that buffer is coupled between the switch and the next processing stage, and

that buffering of data in this manner is well known in the art as a means for pipelining operations in a system.

Regarding claim 44, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to store the data being reordered through the switch in a buffer coupled between the switch and the next processing stage (i.e. the array of CAM cells) as taught by Baum, in the system made obvious by the combination of Chow and Baum as applied to claim 37 above, in order to allow a pipelined operation of the system.

As in claim 46, Chow teaches that the position of a bit may change between the input data and the comparand value (Figs. 7A and 7B; page 5, ¶¶ 49-51).

Claim 47 is rejected according to the same rationale as for the rejection of claim 37 above, noting that a CAM stores data in a matrix of cells (inherently, a CAM comprises a plurality of rows).

Claim 48 is rejected according to the same rationale as for the rejection of claim 37 above.

Claim 53 is rejected according to the same rationale as for the rejection of claim 37 above.

Claim 54 is rejected according to the same rationale as for the rejection of claim 43 above.

Claim 55 is rejected according to the same rationale as for the rejection of claim 37 above. Chow discloses that the comparand is compared with data in the CAM (Page 4, ¶ 40), where the lookup operation in the CAM is understood to compare the input key (i.e. comparand) with data stored in the CAM.

As to claim 56, the rationale derived from Chow and Baum in the rejection of claim 37 is applied herein. However, the combination of Chow and Baum as applied to claim 37 does not teach receiving a plurality of segments of input data and enabling the programmed switch circuitry in response to the segment information as required by claim 56.

Baum further teaches that a complete record of input data may be operated on sequentially by dividing the record into a number of quadwords (i.e. segments), and that the switch is enabled in response to segment information (i.e. i-counter value) indicating which segment of the input data is received at any given time (Figs. 17B, 18A-18C; column 34, lines 11-56). One skilled in the art would recognize that the sequential approach of Baum allows extraction and assembly operations to be performed on an



input data record wider than the processing circuitry width, thereby trading off speed of computation for conservation of circuit area.

Regarding claim 56, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to receive a plurality of input data segments and to selectively enable the switch in response to segment information indicative of the particular segment of input data as taught by Baum, in the system of Chow and Baum as applied to claim 37 above, in order to trade off speed of computation for conservation of circuit area.

Claim 57 is rejected according to the same rationale as for the rejection of claim 56 above.

As in claim 58, Chow discloses that the comparand is compared with data in the CAM (Page 4, ¶ 40), where the lookup operation in the CAM is understood to compare the input key (i.e. comparand) with data stored in the CAM.

7. Claims 38-39 and are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow (US Pub 2002/0126672) in view of Baum (US 5,619,713) and further in view of Ninomiya (US 5,809,330).

Chow and Baum are relied upon for the teachings relative to claim 37 as above, where it is further noted that in the select circuit of Baum a counter provides input segment information to a decoder for generating the select signals to the crossbar switch (Fig. 17B, elements 1725 and 1731; column 32, lines 59-65).

The combination of Chow and Baum does not teach that the select circuit comprises a memory element for storing programmed segment information, and a compare circuit to compare the programmed segment information with the input segment information to generate a select signal as required by claim 38.

Ninomiya teaches a programmable decoder for generating select signals comprising memory elements for storing programmed information, and compare circuits to compare the programmed information with input information to generate a select signal (Fig. 4; column 9, line 59 to column 10, line 5). Ninomiya suggests that making the decoder programmable enables the flexibility of changing the decoder behavior with a simple update to the stored program information (column 3, lines 42-49).

Regarding claim 38, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use the decoder of Ninomiya, to generate the select signals for the crossbar switch in the system made obvious by the combination of Chow and Baum, in order to provide the flexibility of being able to change the decoding behavior as taught by Ninomiya.

Regarding claim 39, the combination of Chow and Baum also does not teach that the memory element and compare circuit form a CAM cell as required by claim 3.

Regarding claim 39, Ninomiya teaches memory elements paired with compare circuits (Fig. 4; column 9, line 59 to column 10, line 5).

One of ordinary skill in the art would readily recognize that a memory element paired with a compare circuit comprises a CAM cell and therefore it would have been obvious to group these elements together in order to realize an area efficient design.

8. Claims 40-41 and are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow (US Pub 2002/0126672) in view of Baum (US 5,619,713) and further in view of Reblewski (US Pub 2003/0 131331).

Chow and Baum are relied upon for the teachings relative to claim 37 as above, where it is further noted that Chow teaches selecting bits individually from the input data (Figs. 7A-7B; page 5, ¶ 49-51) while Baum teaches selecting bits as groups of bytes (Column 32, lines 42-49).

The combination of Chow and Baum does not teach an L-bit by L-bit switch with L select signals as required by claim 40.

Reblewski teaches a generic crossbar device where there is a one to one correspondence between the select signals, input data bits, output data bits (i.e. L-bit by L-bit switch with L select signals) (Figs. 1a -1b; page 1, ¶ 5, lines 1-7), where it is noted that the select signals are provided by memory elements corresponding to the switches.

It is readily apparent that using a one to one correspondence between the select signals, input data bits and the output data bits enables fine-grained switching that allows manipulation of input data fields as small as one bit as taught by Chow.

Regarding claim 40, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use a one to one correspondence between select

signals, input data bits and output data bits as taught by Reblewski, in the system made obvious by the combination of Chow and Baum, in order to enable the fine-grained switching that allows manipulation of single bit data fields as taught by Chow.

The combination of Chow, Baum and Reblewski as applied to claim 40 above, does not teach that the L input data bits are one of N segments of M input bits, where M is equal to N multiplied by L as required by claim 41. However, Baum further teaches that a complete record of input data (i.e. M input bits) may be operated on sequentially by dividing the record into a number (i.e. N segments) of quadwords (i.e. L input data bits) (Figs. 17B, 18A-18C; column 34, lines 11-56). One skilled in the art would recognize that the sequential approach of Baum allows extraction and assembly operations to be performed on an input data record wider than the processing circuitry width, thereby trading off speed of computation for conservation of circuit area.

Regarding claim 41, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to divide M input bits into N segments of L input data bits as taught by Baum, in the system of Chow, Baum and Reblewski as applied to claim 40 above, in order to trade off speed of computation for conservation of circuit area.

9. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chow (US Pub 2002/0126672) in view of Baum (US 5,619,713) as applied to claim 44 above, and further in view of Gandini (US 6,169,685).

Chow and Baum are relied upon for the teachings relative to claim 44 as above.

The combination of Chow and Baum does not teach a global mask register coupled to the comparand storage element and the array of CAM cells as required by claim 45.

Gandini teaches a CAM memory where a global mask register is coupled to a comparand register and an array of CAM cells in order to indicate comparand indifference conditions (Fig. 1, elements "RE" and "MA"; column 3 lines 36-46).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use the global mask register as taught by Gandini, in the system of Chow and Baum, in order to indicate comparand indifference conditions as taught by Gandini.

10. Claim 50 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chow (US Pub 2002/0126672) in view of Baum (US 5,619,713) as applied to claim 47 above, and further in view of Patti et al (US 2001/0048625).

The rationale derived from the combination of Chow and Baum in the rejection of claim 47 above is incorporated herein. The combination of Chow and Baum does not teach that the rows are segmented to form a plurality of columns of row segments as required by claim 50.

Patti teaches a reconfigurable memory including an array of memory storage cells wherein the blocks may be viewed as a partitioning of the rows into a sequence of blocks thereby allowing each block to have bit lines that operates independently of the bit lines of other blocks (page 3, ¶ 32).

Regarding claim 50, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use rows segmented to form a plurality of columns of row segments as taught by Patti in order to allow each block to have bit lines that operates independently of the bit lines of other blocks (page 3, ¶ 32) as taught by Patti.

11. Claims 49 and 51 rejected under 35 U.S.C. 103(a) as being unpatentable over Chow (US Pub 2002/0126672) in view of Baum (US 5,619,713) as applied to claim 47 above, and further in view of Kansal et al (US 6,374,326).

The rationale derived from the combination of Chow and Baum in the rejection of claim 47 above is incorporated herein. The combination of Chow and Baum does not teach an integer plurality of the above system as required by claim 49.

Kansal teaches an integer plurality of CAM arrays for performing concurrent lookup operations (Figs. 2 and 3; column 1, line 66 to column 2, line 13). It is noted that although Kansal shows the comparand generation as a single functional unit (Figs. 2 and 3A, element 260), Kansal teaches the generation of a unique comparand for each lookup (Column 2, lines 14- 23).

Regarding claim 49, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use a plurality of CAM lookup systems as taught by Kansal, where the CAM systems are embodied by the combination of Chow and Baum, in order to perform concurrent lookup operations as taught by Kansal.

Claim 51 is rejected according to the same rationale as for the rejection of claim 49 above.



***Allowable Subject Matter***

Claim 52 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record does not teach or suggest "the number of CAM cells included in each row segment matches a width of the comparand value and wherein the switch circuitry is coupled to provide the comparand value to each of the plurality of columns of row segments" in combination with the other element set forth in the claimed invention.

***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Applicant is required under 37 C.F.R. § 1.111(c) to consider these references fully when responding to this action. The documents cited therein teach input data selection for content addressable memory.

13. The examiner requests, in response to this Office action, any reference(s) known to qualify as prior art under 35 U.S.C. sections 102 or 103 with respect to the invention as defined by the independent and dependent claims. That is, any prior art (including

any products for sale) similar to the claimed invention that could reasonably be used in a 102 or 103 rejection. This request does not require applicant to perform a search. This request is not intended to interfere with or go beyond that **required** under 37 C.F.R. 1.56 or 1.105.

The request may be fulfilled by asking the attorney(s) of record handling prosecution and the inventor(s)/assignee for references qualifying as prior art. A simple statement that the query has been made and no prior art found is sufficient to fulfill the request. Otherwise, the fee and certification requirements of 37 CFR section 1.97 are waived for those documents submitted in reply to this request. This waiver extends only to those documents within the scope of this request that are included in the application's first complete communication responding to this requirement. Any supplemental replies subsequent to the first communication responding to this request and any information disclosures beyond the scope of this are subject to the fee and certification requirements of 37 CFR section 1.97.

In the event prior art documentation is submitted, a discussion of relevant passages, figs., etc., with respect to the claims is requested. The examiner is looking for specific references to 102/103 prior art that identify independent and dependent claim limitations. Since applicant is most knowledgeable of the present invention and submitted art, his/her discussion of the reference(s) with respect to the instant claims is essential. **A response to this inquiry is greatly appreciated.**

14. The examiner also requests, in response to this Office action, support be shown for language added to any original claims on amendment and any new claims. That is, indicate support for newly added claim language by specifically pointing to page(s) and line no(s) in the specification and/or drawing figure(s). This will assist the examiner in prosecuting the application.

15. When responding to this office action, Applicant is advised to clearly point out the patentable novelty which he or she thinks the claims present, in view of the state of the art disclosed by the references cited or the objections made. He or she must also show how the amendments avoid such references or objections See 37 CFR 1.111(c).

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pierre M. Vital whose telephone number is (571) 272-4215. The examiner can normally be reached on 8:30 am - 6:00 pm, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mano Padmanabhan can be reached on (571) 272-4210. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

August 18, 2005

  
**PIERRE VITAL**  
**PRIMARY EXAMINER**